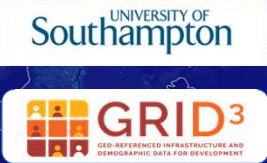


Tools for disaggregated data:
 geospatial analysis for mapping
 population demographics
 Dr Donna Clarke and Prof. Andy Tatem



DATA-POP ALLIANCE

- WorldPop:** Research program focused on methods for improving the demographic evidence base in low/middle income countries
- Flowminder:** Non-profit foundation working with data providers and international/government agencies to operationalize and scale research in support of vulnerable populations and sustainable development
- Open data, open methods
- 60+ researchers, data scientists, PhD students, support staff based primarily in Southampton

Key partners and donors

GOAL TARGETS

1.1
By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day.

1.2
By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.

1.3
Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.

1.4
By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.

1.5
By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

1.a
Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions.

1.b
Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions.



1 NO POVERTY 	2 ZERO HUNGER 	3 GOOD HEALTH AND WELL-BEING 	4 QUALITY EDUCATION 	5 GENDER EQUALITY 	6 CLEAN WATER AND SANITATION 
7 AFFORDABLE AND CLEAN ENERGY 	8 DECENT WORK AND ECONOMIC GROWTH 	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 	10 REDUCED INEQUALITIES 	11 SUSTAINABLE CITIES AND COMMUNITIES 	12 RESPONSIBLE CONSUMPTION AND PRODUCTION 
13 CLIMATE ACTION 	14 LIFE BELOW WATER 	15 LIFE ON LAND 	16 PEACE, JUSTICE AND STRONG INSTITUTIONS 	17 PARTNERSHIPS FOR THE GOALS 	

2015-2030: 17 goals, 169 targets

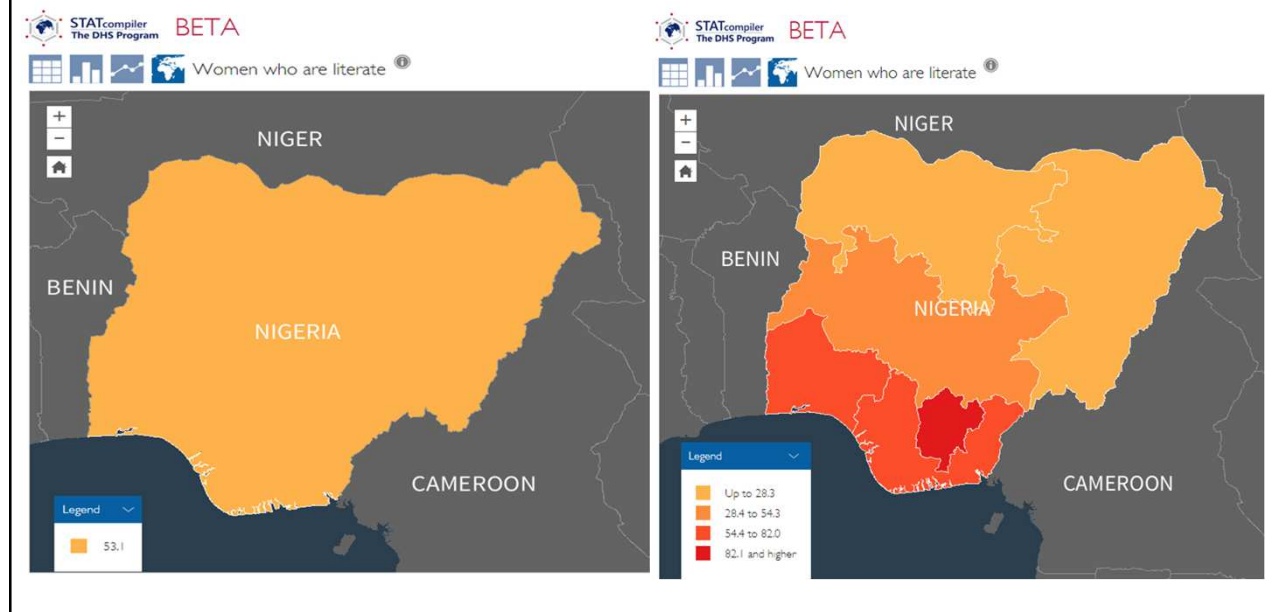


LEAVE NO ONE BEHIND




“Everywhere”

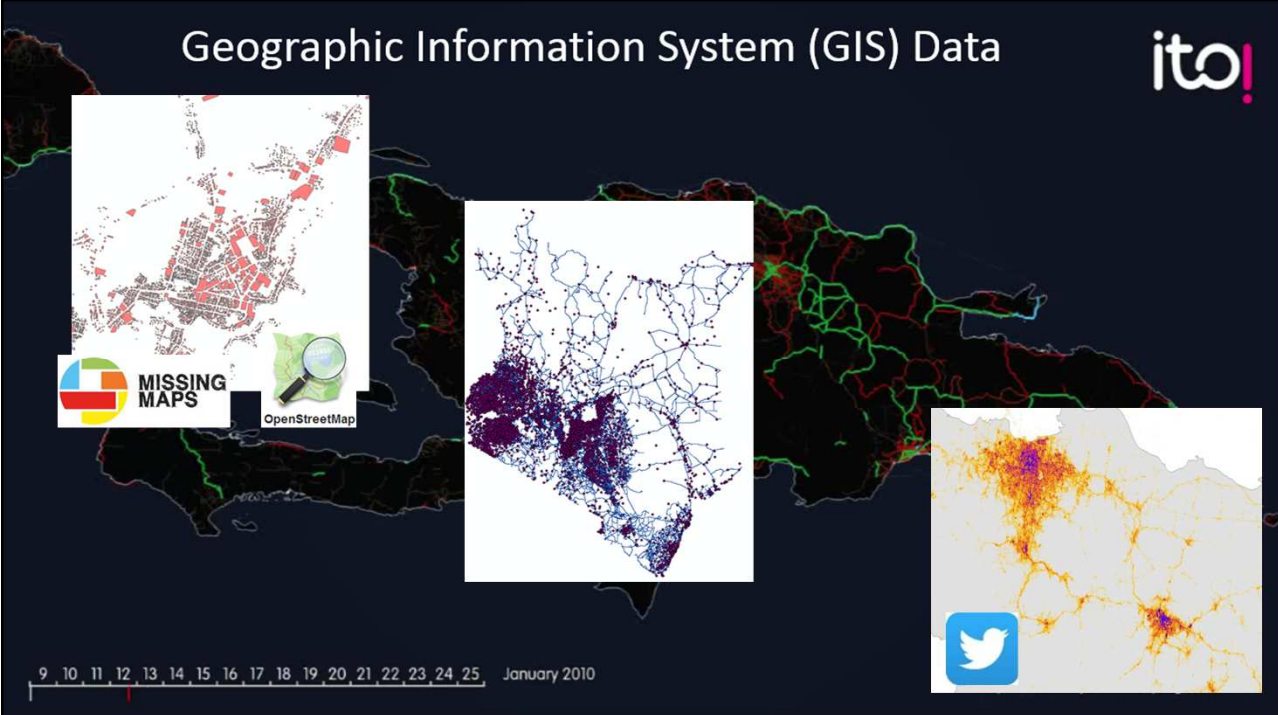
Women who are literate in Nigeria



How can we produce subnational data?

Geographic Information System (GIS) Data

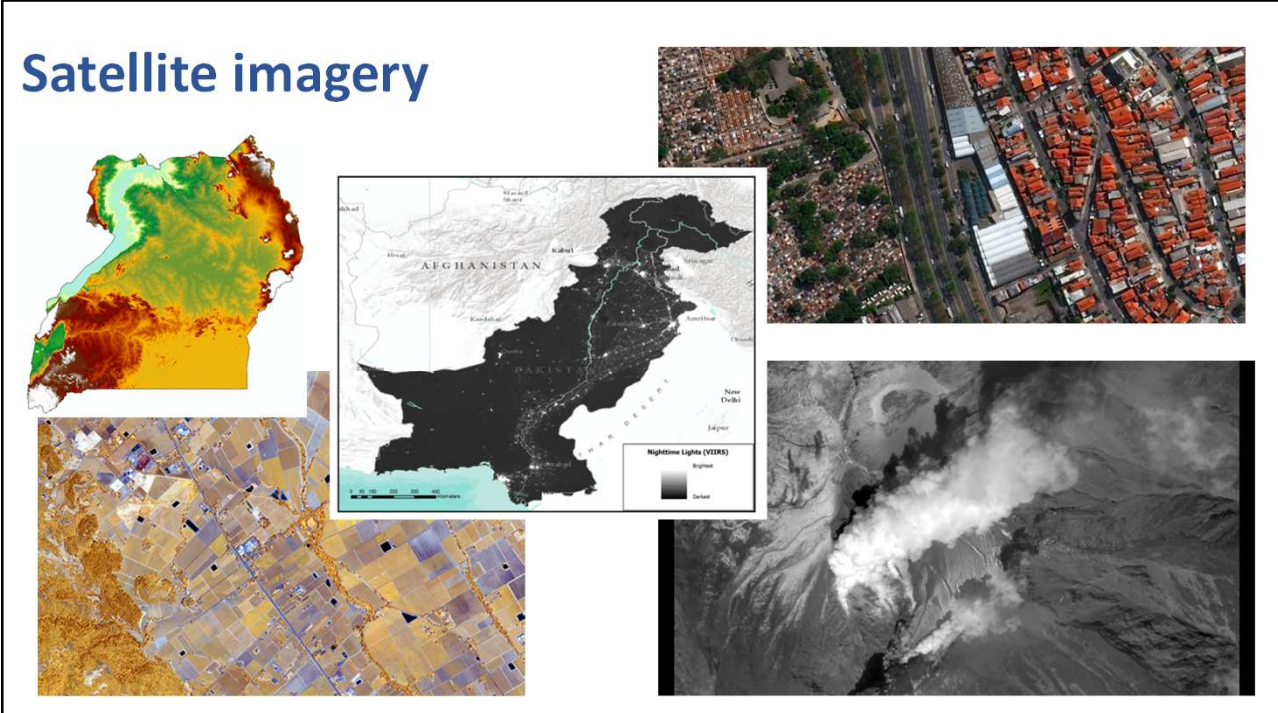




MISSING MAPS
OpenStreetMap

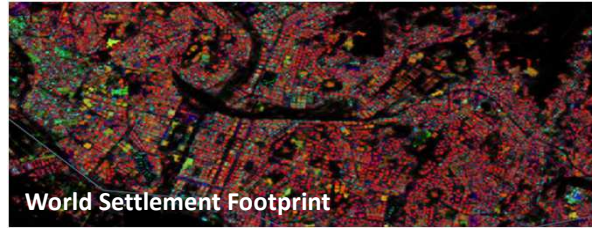
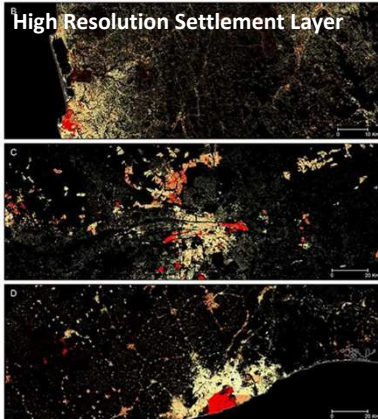
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 January 2010

Satellite imagery

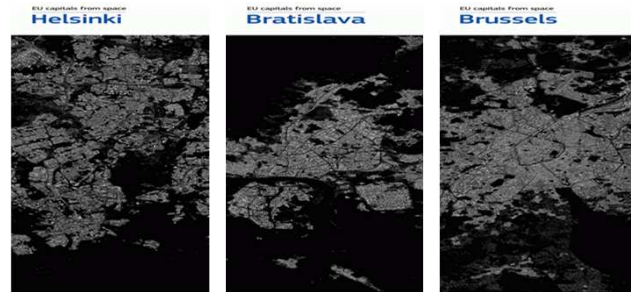


The collage features four distinct satellite-derived images: a topographic map of Afghanistan with elevation colors (green, yellow, brown, red); a map of Afghanistan with a large black area covering the central and southern regions, labeled 'Nighttime Lights (VIIRS)' with a legend for 'Brightest' and 'Darkest'; an aerial photograph of a densely populated urban area with red-tiled roofs; and a grayscale image of a volcanic eruption with a large plume of ash and smoke rising from a mountain.

High Resolution Built-Up/Settlement Datasets



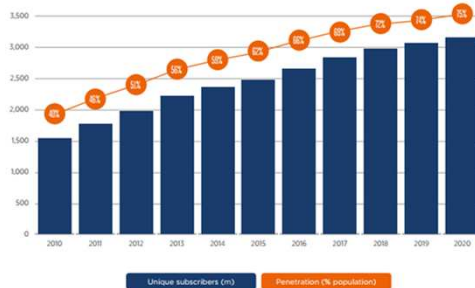
facebook



Global Human Settlement Layer

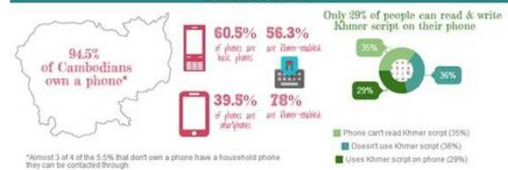
Mobile phone call detail records (CDRs)

Unique subscribers in Asia Pacific



Source: GSMA The mobile economy Asia Pacific 2017
<https://www.gsmainelligence.com/research/7file-336a9db2ab3e959c70e62bf7e867855&download>

Mobiles in Cambodia Findings from the Open Institute 2015 Mobile Phones & Internet Survey



Source: Open Institute and the Asia Foundation 2015
<http://www.channamunon.com/2015/11/mobile-phones-internet-cambodia-2015.html>

QUICK FACTS ABOUT DIGITAL MEDIA IN THAILAND

DEMOGRAPHICS


POPULATION **66.7 MILLION**

MOBILE PENETRATION **110%** WITH 60% SMARTPHONES
 YUP... THERE ARE MORE PHONES THAN PEOPLE

Source: Nielsen. The digital media habits and attitudes of South East Asian Consumers 2011
https://wiki.smu.edu.sg/digitalmediaasia/Digital_Media_in_Thailand

Mobile phone call detail records (CDRs)





1 NO POVERTY



Mobility: Changing densities, flows, seasonal/permanent migration

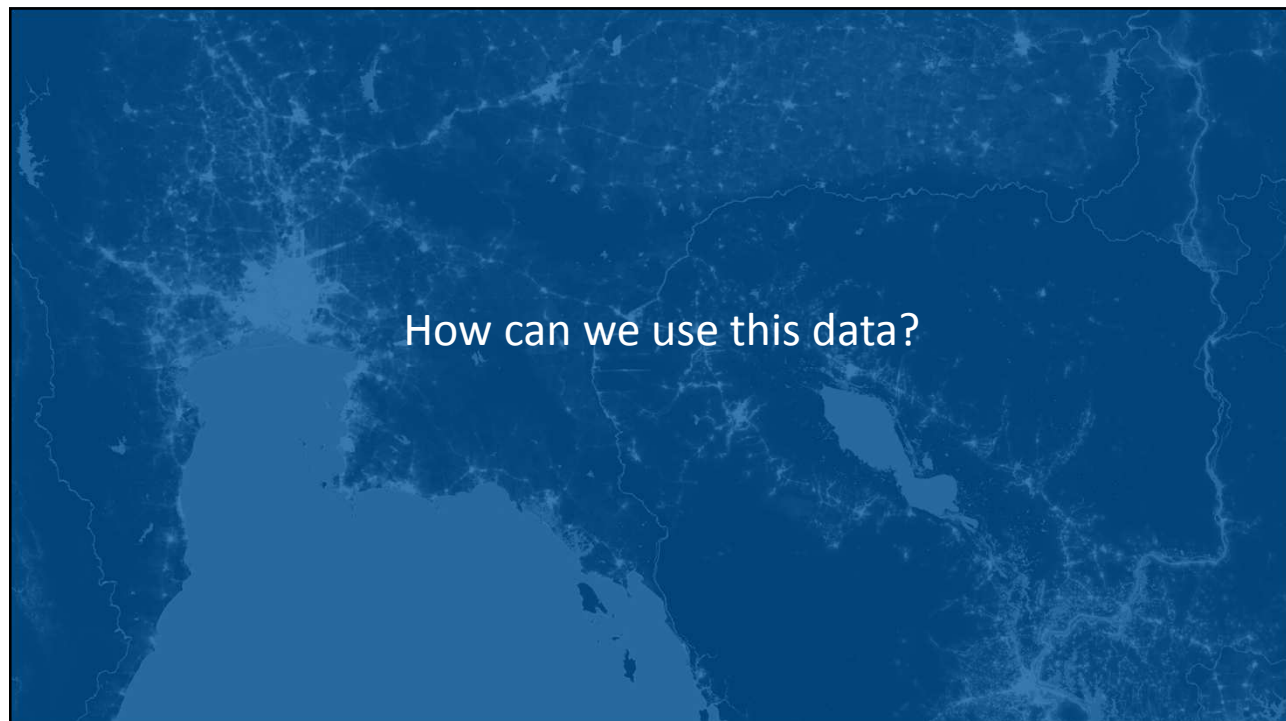
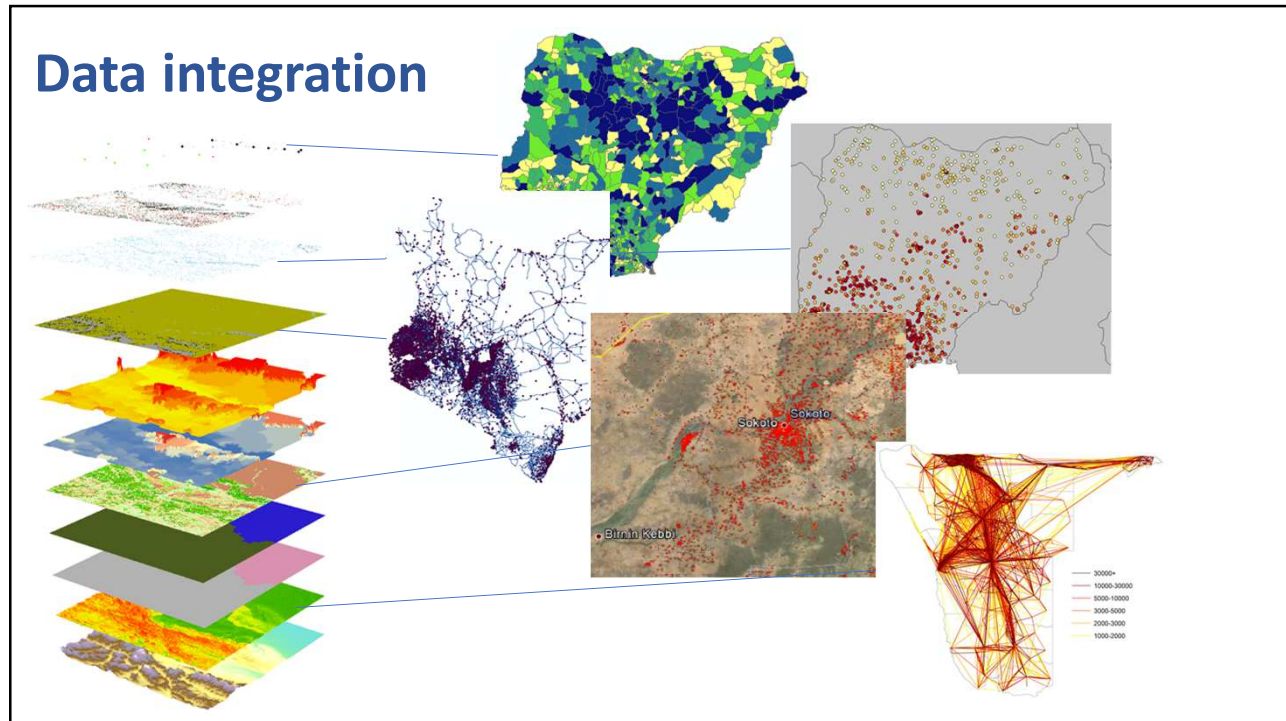
Social networks: Number of contacts, calling patterns

Consumption: Credit purchase frequencies, top-up amounts

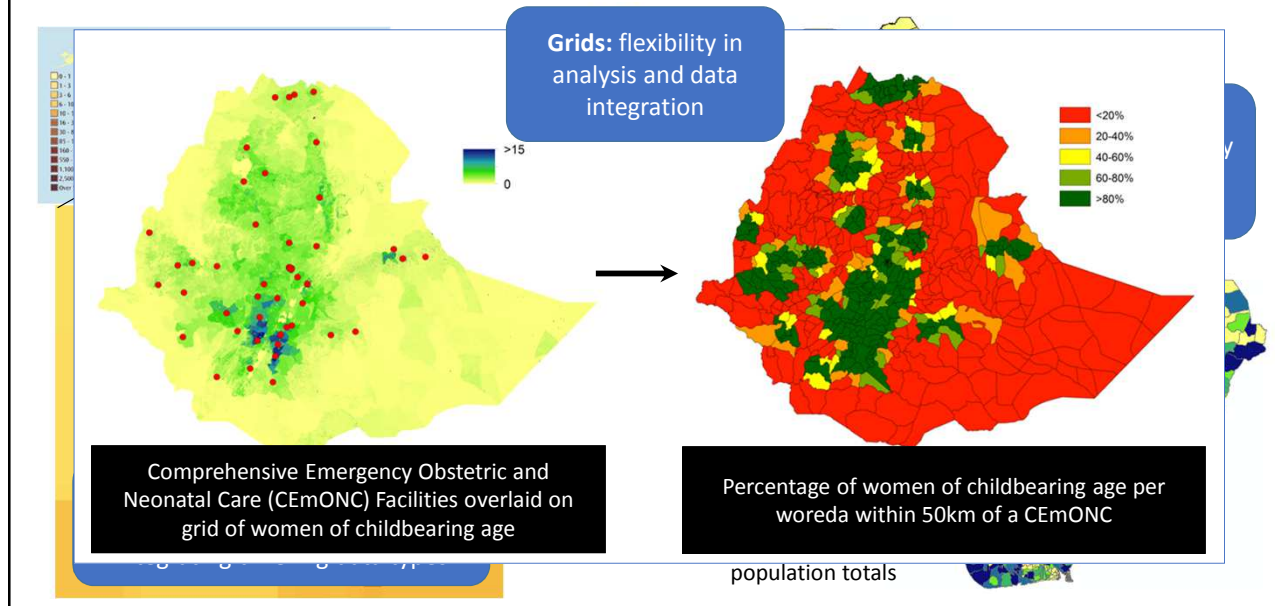
Protecting confidentiality

- Aggregate summaries
- Regulator approval
- Raw data never leaves operator

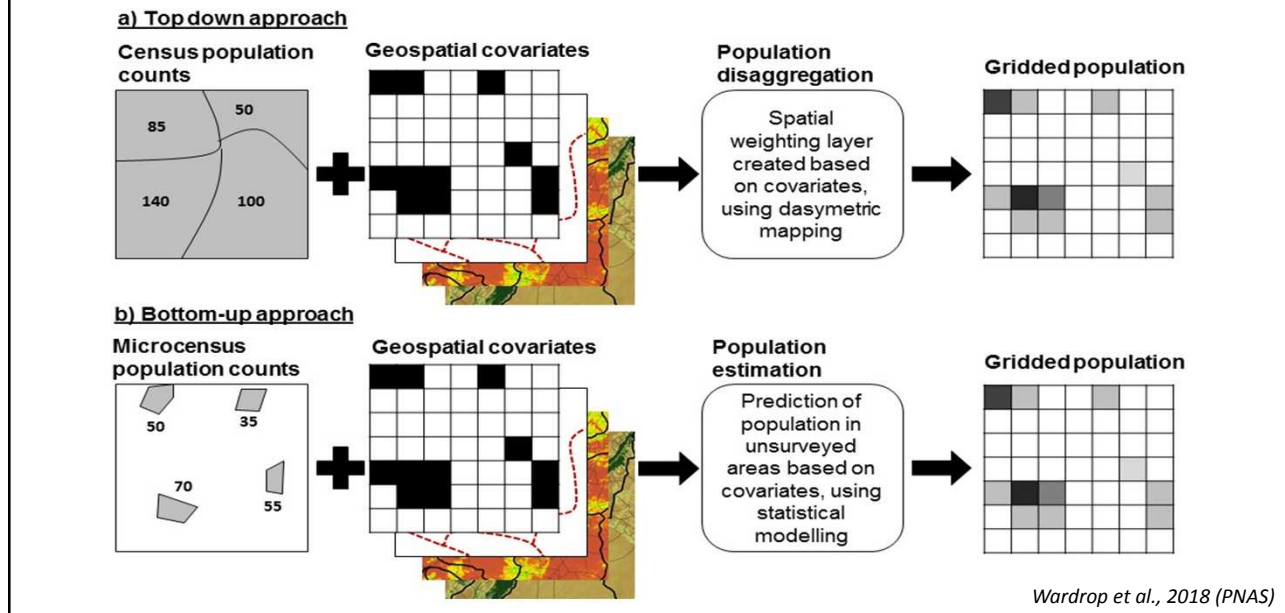





Gridded population data

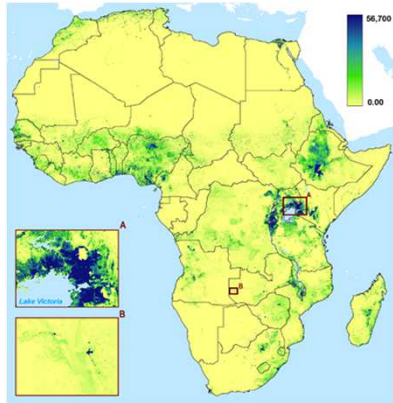


Top-Down Vs Bottom-Up Approach

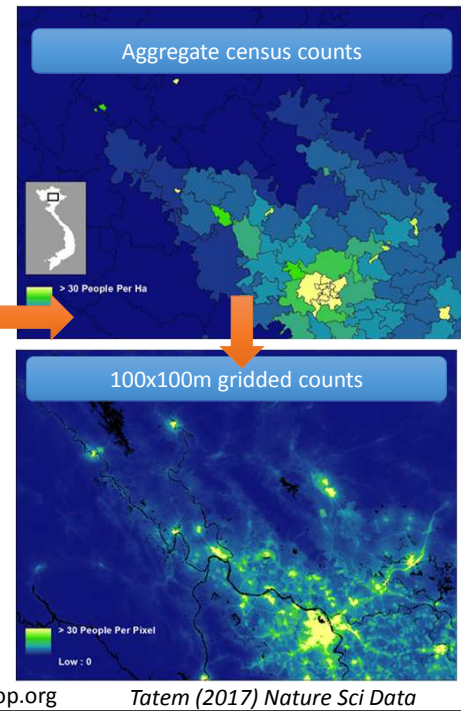
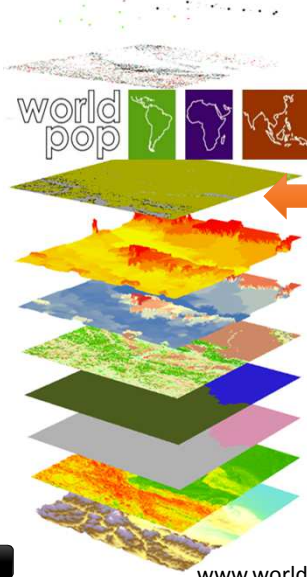


Top-down disaggregation

Integration with satellite/GIS data related to human population distribution patterns to disaggregate counts to regular grids



People per 1x1km 2017

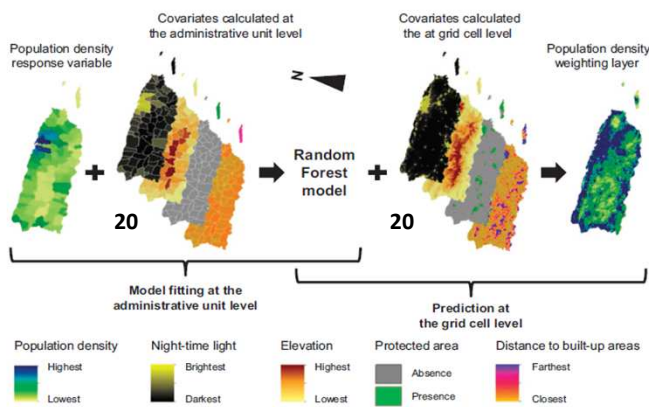


www.worldpop.org

Tatem (2017) Nature Sci Data

Random Forest-based Dasymetric Approach

- Used to disaggregate subnational census-based figures[^],[#]



[^]Stevens et al, 2015; [#]Sorichetta et al., 2015

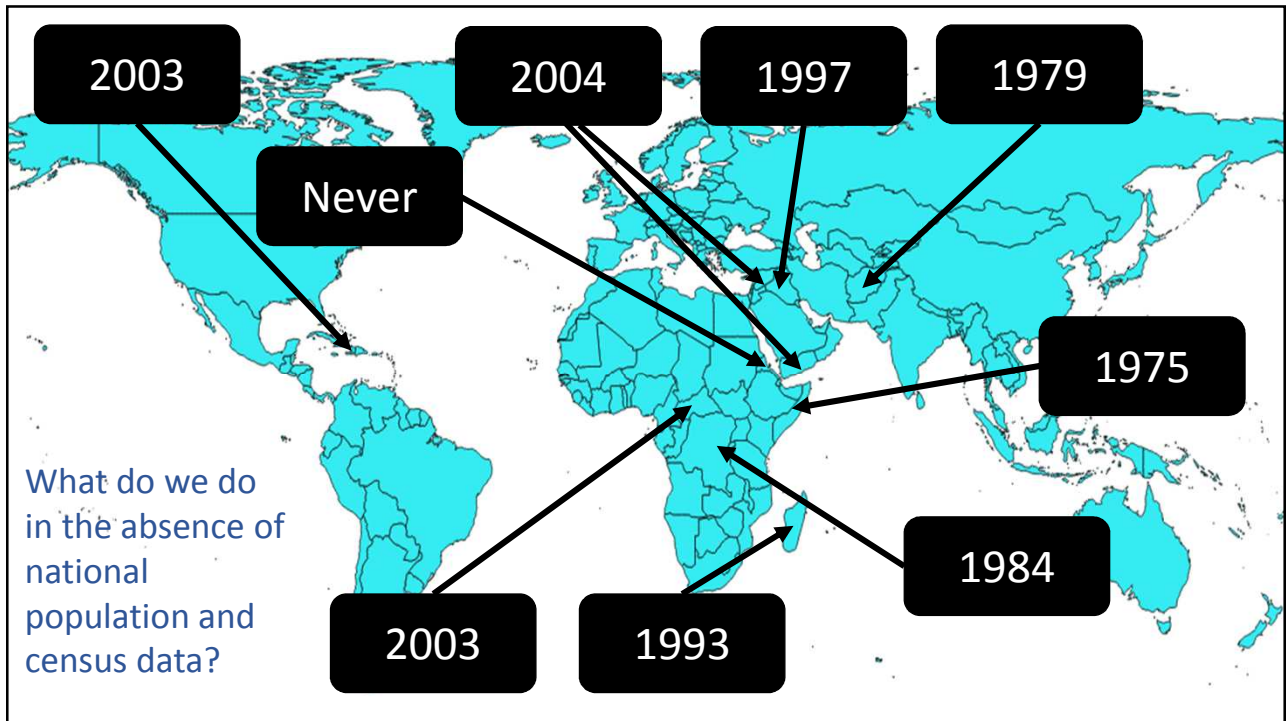
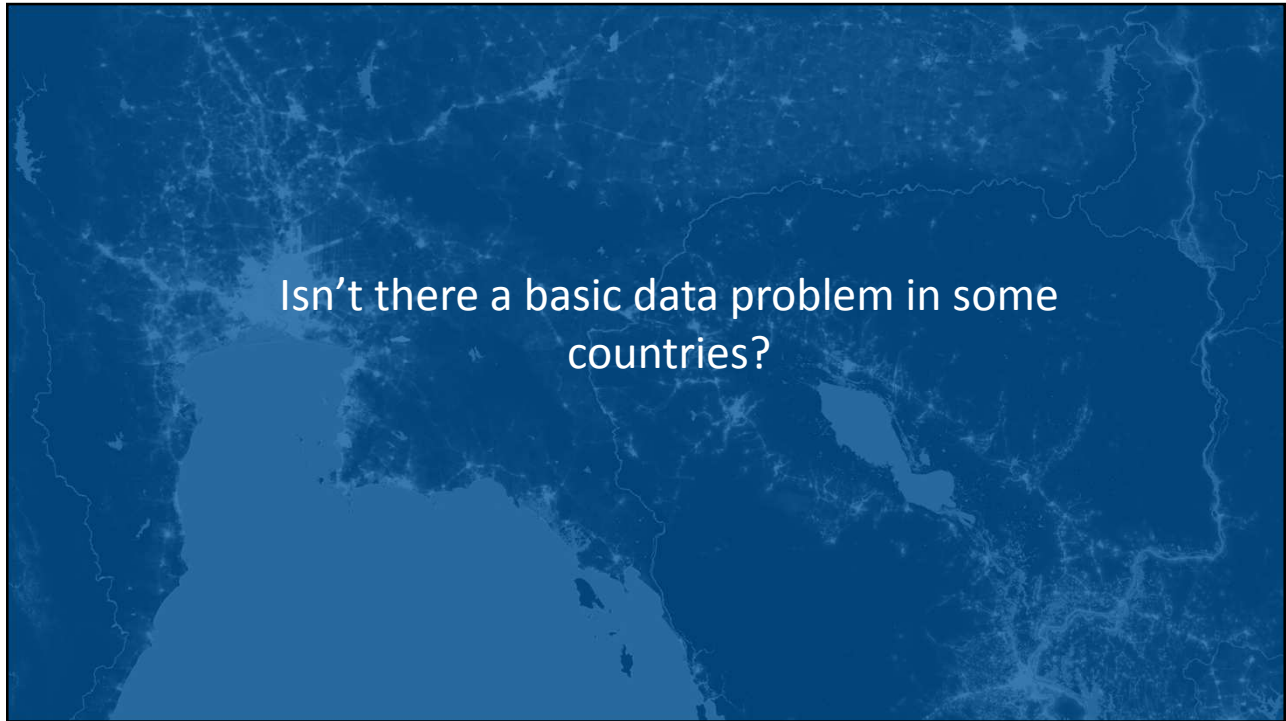
PLOS ONE

Disaggregating Census Data for Population Mapping Using Random Forests with Remotely-Sensed and Ancillary Data

Forrest R. Stevens^{1*}, Andrea E. Gaughan¹, Catherine Linard^{2,3}, Andrew J. Tatem^{4,5}
 1 Department of Geography and Geosciences, University of Louisville, Louisville, Kentucky, United States of America, 2 Fonds National de la Recherche Scientifique (F.N.R.S.-FNRS), Rue de Egmont 5, B-1000 Brussels, Belgium, 3 Biological Control and Spatial Ecology, Universitat Liria de Burxelas, CP 19012, Avenue PD Roosevelt 50, B-1050 Brussels, Belgium, 4 Department of Geography and Environment, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom, 5 Fogarty International Center, National Institute of Health, Bethesda, MD 20895, United States of America
 * forrest.stevens@louisville.edu

SCIENTIFIC DATA

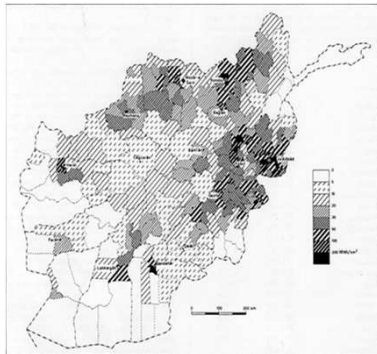
OPEN High-resolution gridded population datasets for Latin America and the Caribbean in 2010, 2015, and 2020
 SUBJECT CATEGORIES
 - Geography
 - Malaria
 - Sustainability
 - Environmental sciences
 Alessandro Sorichetta^{1,2}, Graeme M. Hornby³, Forrest R. Stevens¹, Andrea E. Gaughan¹, Catherine Linard^{2,3} & Andrew J. Tatem^{1,4,5}



High-resolution population mapping in Afghanistan



Afghanistan - Background

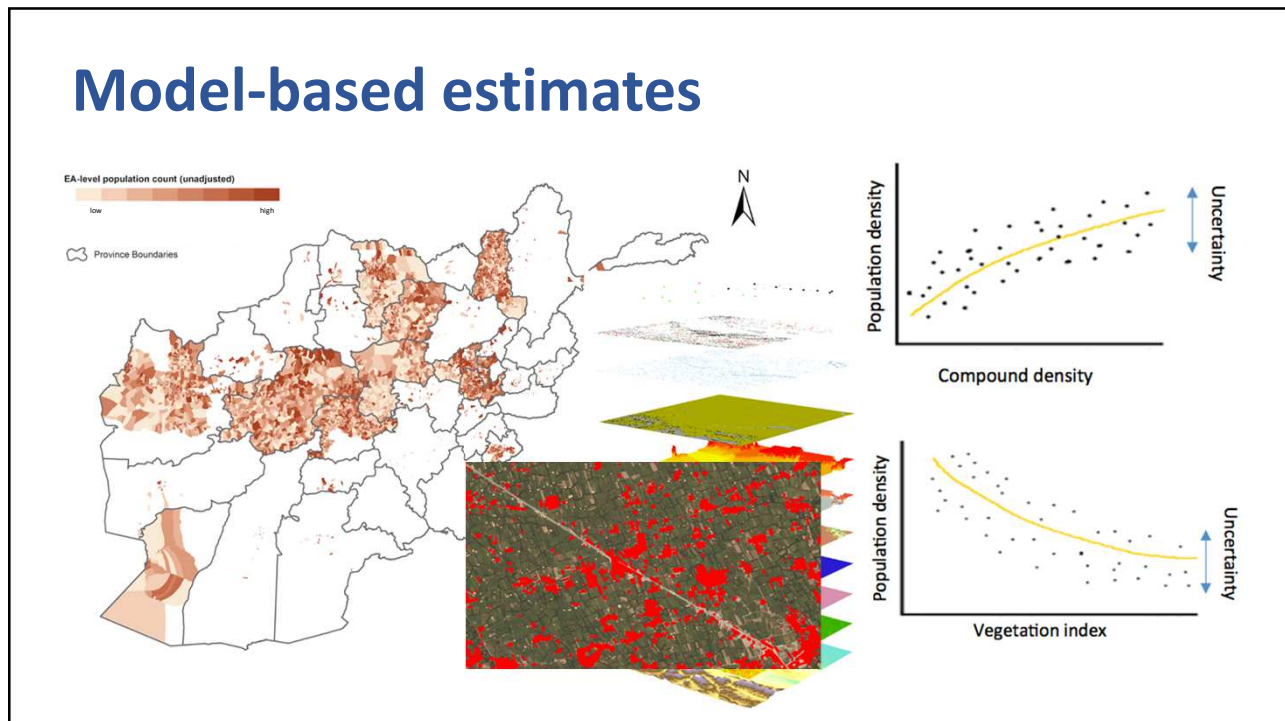
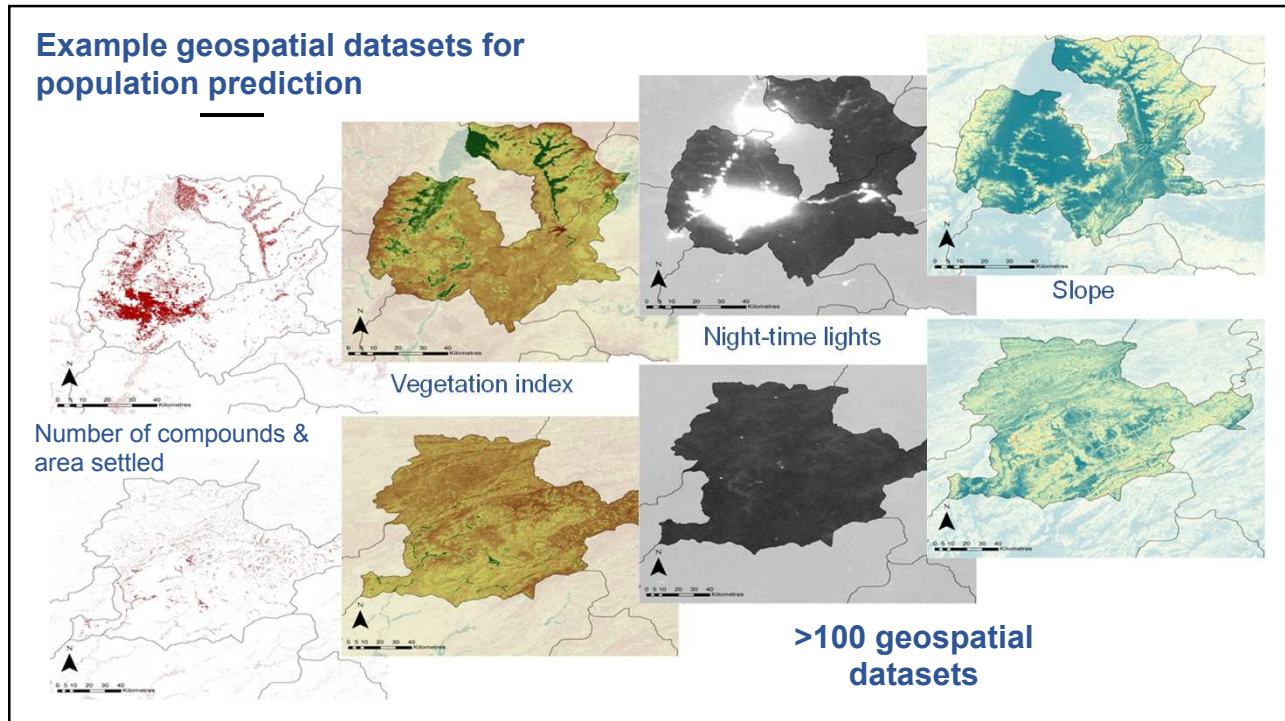


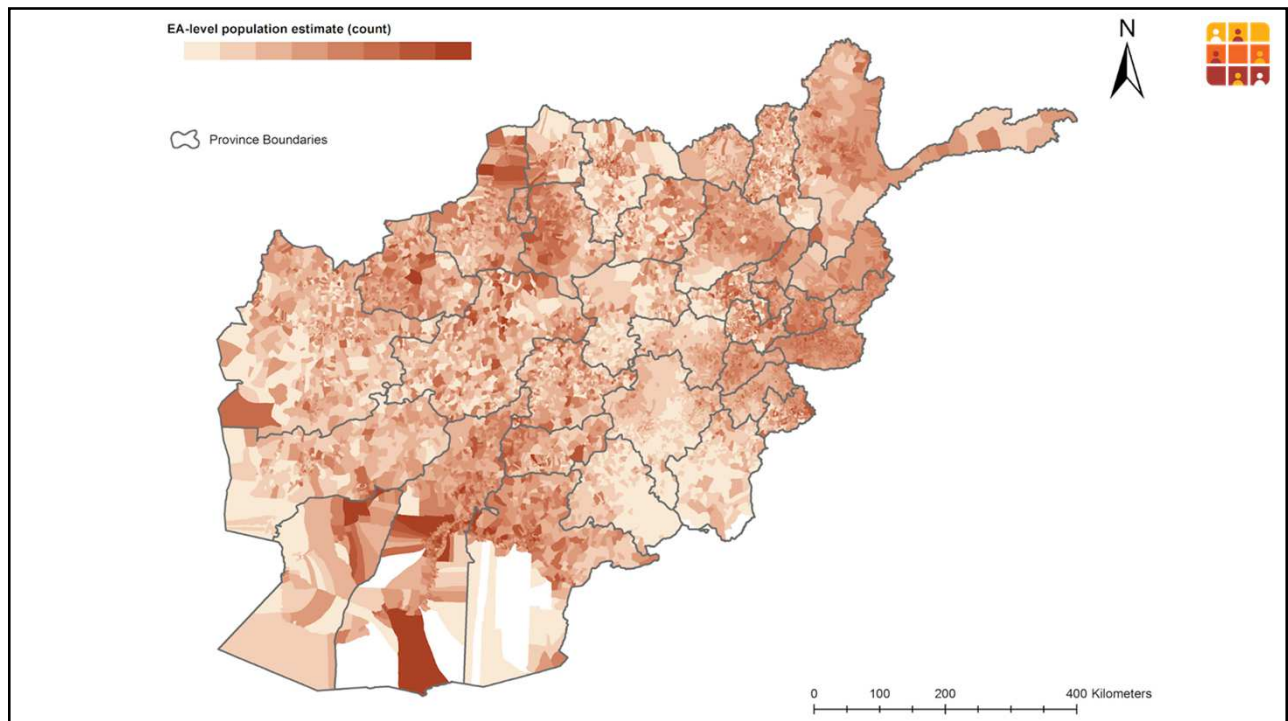
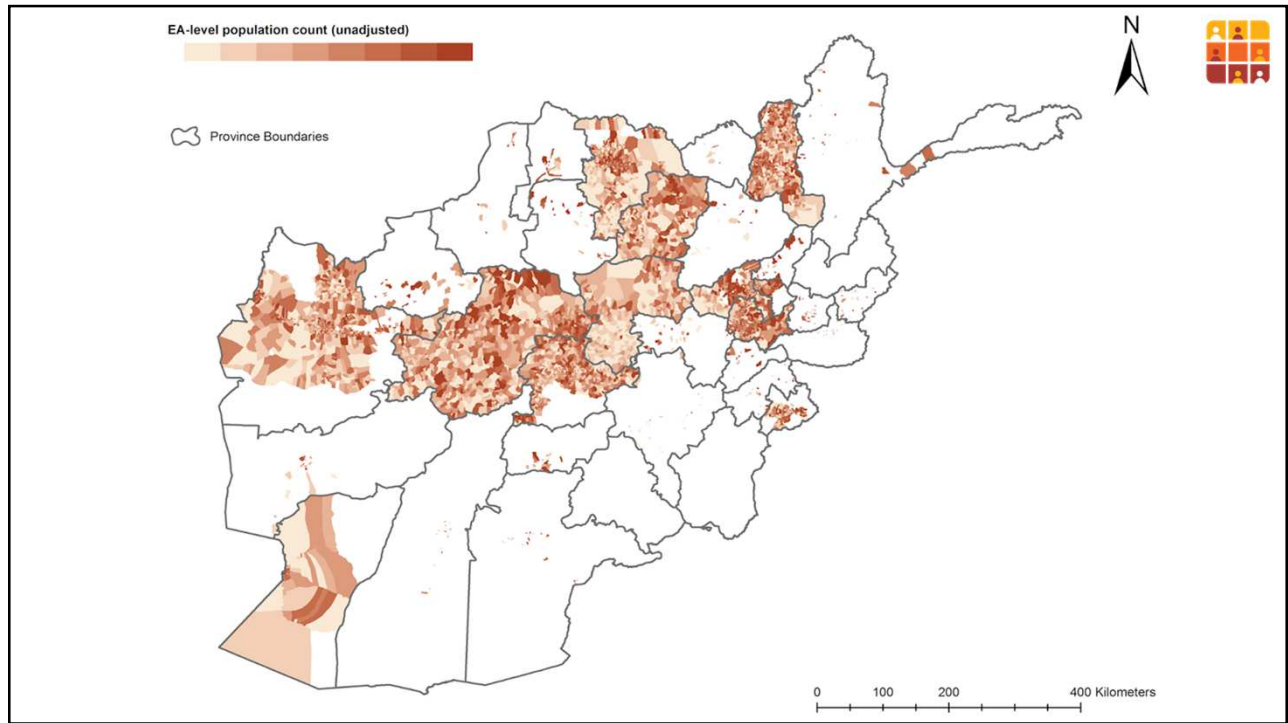
Last national population census was in 1979
Significant uncertainties in national and subnational estimates

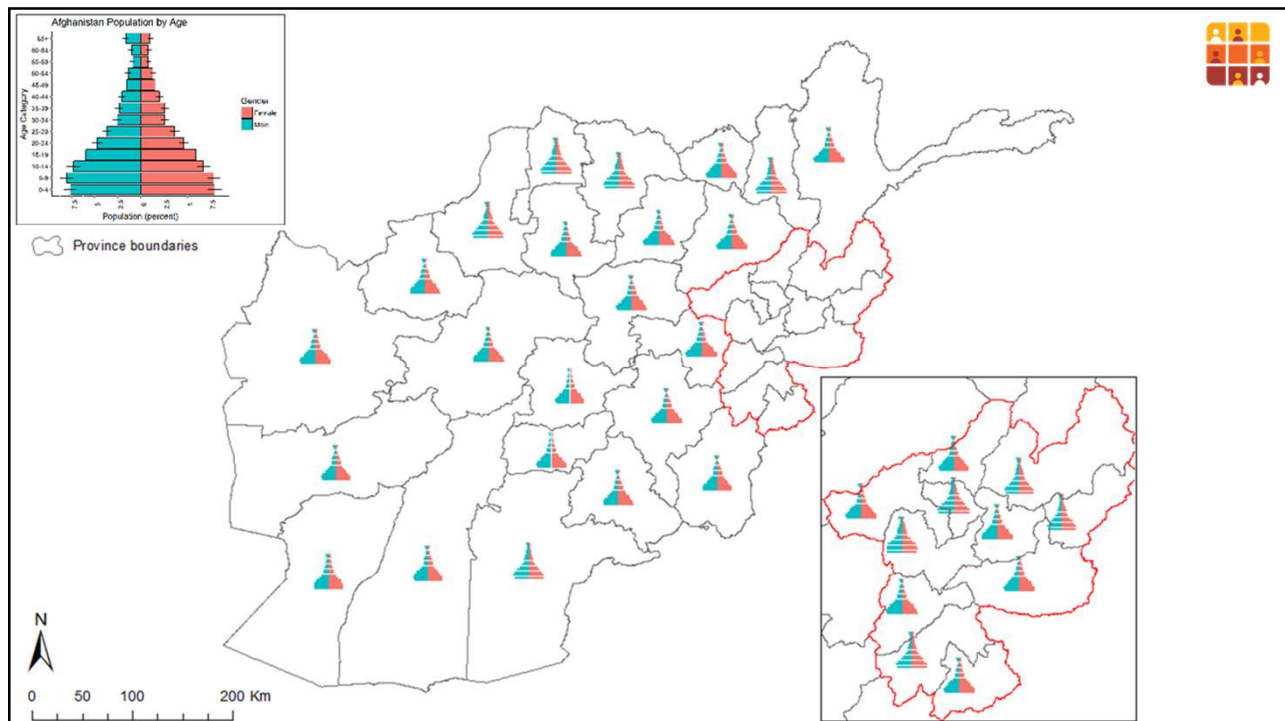
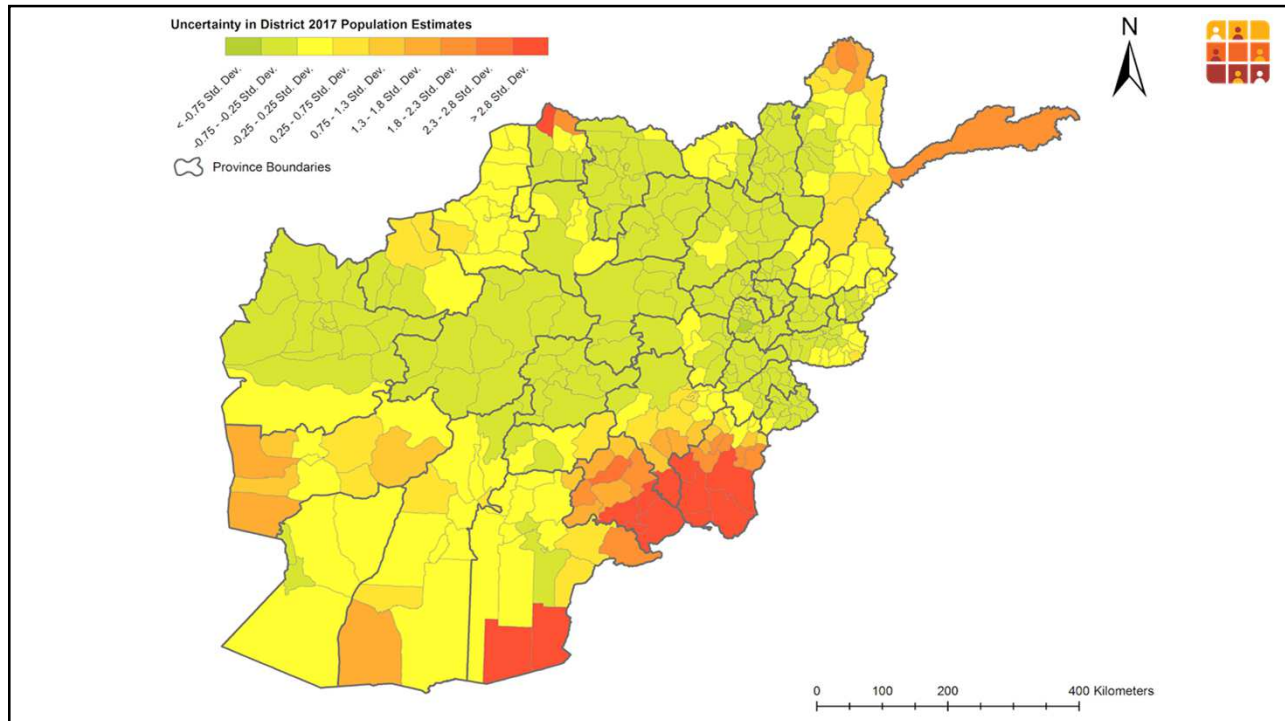
1979 Census map

One-third of country covered by a rolling census (SDES), but insecurity preventing additional data collection

President Ghani requested exploration of new methods for obtaining subnational population numbers









GRID³

GEO-REFERENCED INFRASTRUCTURE AND
DEMOGRAPHIC DATA FOR DEVELOPMENT

BILL &
MELINDA
GATES
foundation



world
pop
FLOWMINDER.ORG



Center for International Earth
Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY

Our vision

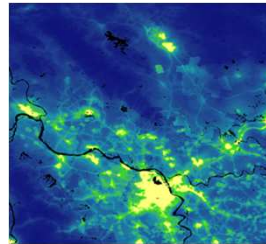


“*We envision a world where data analytics puts everyone on the map, ensuring that especially the most vulnerable count.*”

What we do



GRID³ provides support to low- and medium-income countries to collect, analyse, integrate, disseminate, and utilise high-resolution geo-referenced data for development and humanitarian decision making.



A Global Partnership



Funding Partners



Oversight and
Decision Making

Implementing Partners



Technical Expertise and
Capacity Strengthening

Managing Partner

Center for International Earth
Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY

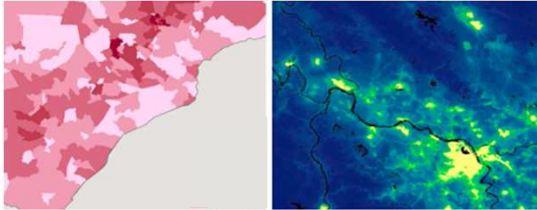
Technical Support and
Advocacy

Spatial Data Production

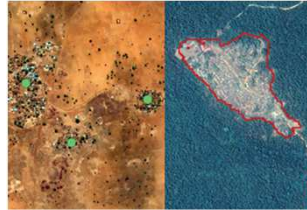


GRID³ helps produce three spatial data layers to meet critical development needs:

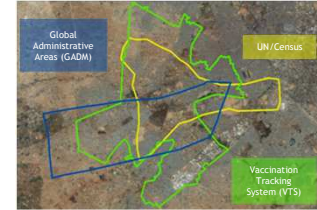
High-Resolution Population Maps



Settlement Locations



Subnational Boundaries



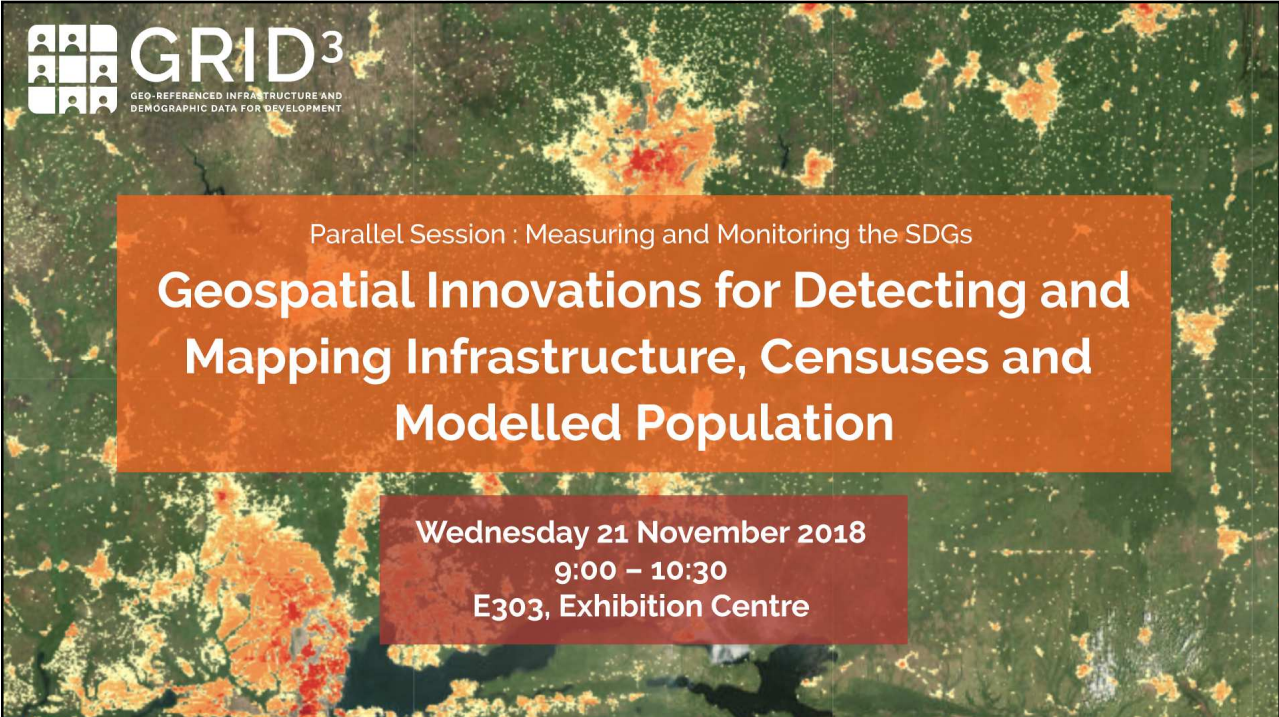

Current Focus



GRID³ is underway within five African countries:

Nigeria
Mozambique
Zambia
Tanzania
Democratic Republic of the Congo





Parallel Session : Measuring and Monitoring the SDGs

Geospatial Innovations for Detecting and Mapping Infrastructure, Censuses and Modelled Population

Wednesday 21 November 2018
9:00 – 10:30
E303, Exhibition Centre